An Essay

Paſsed March 12th. 182

On.

Diabetes

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Diabetes.

Diabetes in its history, symptoms, causes, pathology & cure, presents a topic of important & interesting inquiry. In its history, involving the consideration of names & hypotheses renowned in the annals of our science: in its symptoms exhibiting the complication of a rare phenomenon & dangerous disorder: and in its causes, pathology, & cure, demanding the cooperation of varied speculation & profound research. Thus equally important in every department, diabetes might ask the contribution of matured experience: Precedent however has delivered it, as much to the <u>pen</u>, as to the recipe.

A cloud of obscurity envelops the history of this disease. The eye of anxious research has scanned in vain the records of ancient medecine, to impreſs the sanction & the testimony of Hippocrates upon its early history. <u>Symptomatic</u> in all his views of variations in the urine, he has no where made it the object of special regard. On classic ground the omission has been redeemed, & diabetes portrayed in the language of the brief & accurate Celsus. "At quum urina super pitimum modum mingitur, & jam sine dolore profluens maciem & periculum facit." Thus originating, this description obtained in the learning & experience of Aretaus confirmation & a name; & in the works of Galen & Ætius the distinction of a formidable & important disorder. Suspicion of the veracity, or susceptibility of such nar-

rators ought to posseſs no feeble basis. For the information of Celsus, derived leſs from personal observation, than from sources extensive & confirmed, was thus doubly authenticated by the testimony of Aretaeus & Galen. Time veils these regions of literary antiquity, permitting the enthusiast to magnify & the sceptic to disbelieve the memorials of former cultivation; but these by the real medical philosopher are alike disowned.

Bidding adieu to classic record, we appeal to the histories of the East. Dr Christie having there developed a new & interesting feild of investigation. It appears from his paper in the Edinburgh Journal, that in a work translated from the sanscrit more than three centuries since, by the ancient physicians of Ceylon, there are numerous accounts of the madu mehi, or honey urine. How long it has existed in the sanscrit, imagination alone can define. This fact abundantly proves that diabetes has long been known, & further that it has been known as the diabetes mellitus. It proves farther also that the disease described by the ancients of Europe was of a similar nature.

Diabetes is generally introduced by various degrees of gastric distreſs, insatiable thirst, & morbid appetite. The first diagnostic symptom is the frequent & copious discharge of pale, amber-coloured, sweet urine. This is attended in no particular order, by wasting & emaciation, & a sense of great debility; an indisposition & incapacity for mental & corporal exertion; with head-ach, impaired vision, & vertigo. The tongue becomes white in the centre with bright red edges, the gums tender, red, swollen, & often ulcerated, & the teeth at first affected with tooth edge, soon loosen & drop out. The secretions are all diminished, the bowels becoming costive, the bile diminished, the skin dry, harsh, parched, & clammy.

& the semen suppressed, with frequent impotency. The mucus on the urinary lining becomes diminished. ~~& devoid of its protection~~ & devoid of its protection, the glans, prepuce & urethra in the male, & the meatus urinarius in the female are liable to excoriation; the inflammation extending occasionally in both sexes, through the bladder & ureters, to the very pelvis of the kidneys: & as the last altered secretion, the saliva becomes thick, viscid & frothy with a sweet or mawkish taste. The pulse is smaller than in health, the lumbar regions are somewhat painful & oppressed, & lastly, there is often a burning in the palms of the hands & the soles of the feet.

Gastric distress attends as constantly as the changes in the urine. In a less degree it sometimes appears long antecedent to the complete developement of the disorder: in that state there is frequently pain & burning in the stomach & bowels, & tenderness at the epigastrium. The stomach is not affected in sensation alone, eructation & emesis demonstrate its contents to be of an acid character, like the fluid of pyrosis. Examination shows the mucous coat of the stomach to differ much from the healthy state. Diabetes otherwise relieved, sometimes terminates in fatal affections of the bowels.

The thirst in this disease is insatiable, & is only partially suspended by liberal potations of cold, aqueous fluids. The state of the diabetic may be compared to that of the unfortunate Tantalus, if insatiate repletion, is no better than unquenched desire. The bulimia is equally violent, gaining no respite but in the consumption of vegetable matter. The reception of ingesta is immense & almost incredible, amounting frequently according to the Parisian pathologists, in solids & fluids together to one third the weight of the body.

The urine however forms the object of universal interest. & in the fluctuations of its quantity or qualities. have originated the numerous varities of the disease. The quantity of the urine first excited observation; & earliest attracts the notice of the uninformed. Its ordinary diurnal proportion varies from ten. to thirty pints; in some instances, not exceeding the natural quantity, & in others, becoming enormous. Cases of the latter kind are more interesting than important. We have one in Duncans Annals, in which the greatest daily discharge was 73 pints; one from Professor Chapman in which 96 pints of urine were discharged in less than twelve hours; one from M. Baume of 165 pounds daily: & finally Fonseca is quoted in the Dictionnaire, as stating the evacuation to arrive at 200 lbs in 24 hours.

It has been asserted, that the average of the urine often exceeds that of the ingesta. That it may exceed that of the *liquids*, every one acknowledges. thus Aretaeus "The quantity of liquid taken in. is not equal to the quantity of urine. for more urine is passed." This may be explained without much difficulty, because the ordinary articles of animal & vegetable diet. contain three fourths of water, & in various culinary processes an additional proportion is consolidated. Thus flour combines with one half water, in changing to bread. When the urine then surpasses the liquids by two or three *pounds*, the cause is evident; taking also into consideration the *increased specific* gravity: when it outweighs the whole ingesta. we are involved in a difficulty. It may be proper to consider the credibility of this subject. Bardsley is the only modern author of note who has given instances of it. & in this he is opposed by Rollo. Watt. & Lubbock. The first doubted if the urine ever exceeded the ingesta; & the two latter declare that they never saw a case of the kind.

n this subject has always met with some credence we will state the various hypotheses. Cardanus A.D. 1481 relates the case of a girl, who passed daily 36 lbs of urine for 60 days her diurnal ingesta amounting only to 7 lbs. A consultation decided that the excess arose from the conversion of the air in the arteries into water: the air being continually replaced. This doctrine of the condensation of air into water prevailed in the fifteenth & sixteenth centuries. Bacon has fully illustrated it. The second explanation was by cuticular absorption. Of this Cardanus gave the first hint adding to the opinion in the case above, the humidity of the atmosphere. Ettmuller taught something similar and Morgagni & Haller were also disposed to favour the absorption of the aqueous particles floating in the atmosphere. The first experiments were made by Currie A.D. 1790. he subjected a diabetic patient to the warm bath & discovered no absorption. He concluded farther from numerous experiments, that absorption occurs neither in health or in disease. De Girard has communicated 28 accurate experiments upon a diabetic with a similar result, which has been corroborated by the tests of Bardsley & Thenoff. The hypothesis of cuticular absorption must be false, because this function is dubious in health & must be impossible in a disease in which the epidermis is thickened & the rete mucosum anemic.

A third hypothesis supposes certain changes of the blood in the pulmonary capillaries. This depends on a decision of whether the vapour of respiration is an exhalation or the result of combination. These phenomena are not incompatible, both probably occurring. In fine, if (which is improbable) the urine ever exceeds the whole ingesta, I must beg leave to refer the increase to the pulmonary & other capillaries, leaving objection & defence to abler investigators

The quantity of the urine, has originated few varieties of the disease. the principle are the chronic & acute of Stoll, the mitis & gravior of Brown & Bardsley, & the slow & rapid of Latham of the mitis, chronic or slow diabetes Stoll & Latham give several interesting cases. The quantity of the urine has been rejected as a characteristic of disorder reminding us more of the niceties of ancient <u>logic</u>, than the distinctions of modern science.

Before & somewhat since the discovery of the saccharine nature of diabetic urine divisions arose from its varied transparency. We had then the lentes & crassa of Celsus. the vera & spuriosa of Etmuller & the Lactea of Home. Of late the distinction has been into diabetes mellitus & insipidus. a distinction by no means necessary or proper & affecting neither symptom or treatment, but actually expressing a greater or less proportion of saccharine matter. When taste was the criterion the insipidus was thus denominated. Analysis has proved the constant existence of sugar. In twenty cases Cullen found but one insipid, which was probably decided by the taste. Lister's opinions which he quotes on this subject are declared by Bostock to be hypothetical. The existence of the diabetes insipidus, as depending on the absence of sugar, being disproved it follows that the disease described by the ancients belongs to the mellitus. Alluding for the last time to this subject we observe that the discoverers of its saccharine nature entertained no idea that it differed from the ancient disease. It has been farther suggested that the ancients might have noticed the sweetness of the urine & attributed it to quantities of hydromel which they habitually consumed. On this Cullen writes well." Though neither the ancients nor in the countries of Europe the moderns till the latter were directed to

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Willis discovered the sweetness of the urine: & attributed it to the absence of its saline contents & the presence of certain sulphureous particles. Salmon judged it to be saccharine because it stiffened upon the linen: which Dobson by evaporating the urine established beyond all doubt. Since that time every chemist in Europe has examined it. The East Indians have long known that the urine contains sugar. It is rather astonishing that this fact was noticed so lately, because there are many cases in which the urine drying, the sugar crystallizes on the linen, pantaloons, hose or wherever the clothes are spattered. In my native city an old gentleman suffering with diabetes, used to pick large quantities of caked sugar from the inside of his cloak.

The urine is usually very pellucid; rarely cloudy. The specific gravity of healthy urine being from 1.010 to 1.020, the diabetic ranges from 1.028 to 1.040. The average proportion of saccharine extract to the pint of urine is about ℥iſs. The weight of extract thus voided is truly astonishing. I calculated a case from Bardsley in which it exceeded four pounds a day. The urea contained in diabetic urine is scarcely appreciable, showing the secretory power of the kidneys to be also much diminished: the return of this secretion marking in part the return to health: The saline contents of the urine are not very apparent, although the absolute quantity equals that of health.

The blood in this disease presents peculiar & important phenomena in part known as & not recognised as the discovery of any particular person. When just drawn it assumes an

azure hue, & remaining at rest for some hours coagulates, presenting a mass of rotten crassamentum covered for the most part with a thin coat of yellow buff. Exposed in this state to the action of the atmosphere, the blood does not become putrescent but dries & assumes a venous appearance. Marshal mentions the dissection of a diabetic in whom there was no proper blood, but a liquid like well made thin chocolate. Dobson thought that he had detected the presence of sugar in the blood, an opinion contradicted by the experiments of Wollaston, Nicholas & Gueudeville, & other eminent chemists. On this point Pearson's opinion is good "that no number of negative experiments can disprove a positive one" yet due respect ought to be paid to such a preponderance of opinion. The distribution of the blood in diabetics is deserving of attention. The superficial veins are frequently invisible rendering phlebotomy very difficult. & dissection & the symptoms during life as often shew that the internal venous, especially the portal circulation, is much engaged.

The state of the skin in diabetes is very peculiar. In addition to our previous description the cuticle in many cases is much thickened, & appears hard & smooth or squamated like the scales of a fish. Perspiration & the oily secretion stop & the skin & cellular membrane almost devoid of vascularity are contracted & glued upon the muscles.

To describe diabetes is to present its diagnosis. & yet so strongly marked in all its symptoms it is frequently overlooked, especially in children. The age at which it occurs has excited some discussion & frequently leads to the above mistake. It has been said by authors of influence as Heberden & Thomas, that diabetes occurs only in the decline of life & the dissolution of the constitution. The question rests not on the

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decisions of individual experience: but on the proper average of authentic & independant cases. From the works of Home: Rollo. Ferriar: Bardsley. Latham. Watt. Prout. & the London. Edinburgh & American Journals I have obtained without selection ninety seven fair cases with the individual ages. Of these the medium age is 40. & of the English cases alone. 39 years of age. One fifth of the whole are women among whom the average age is thirty. Of the 97. fifty five were forty years of age & below it. something more than one fifth were over fifty. & at sixty or the decline of life we have only eight, or one twelfth. I think that the small proportion of women may result in part from concealing the disease.

Diabetes is the result of causes differing less in the rapidity, than in the manner of their operation. This disease often steals so gradually over the powers of its victim: that it is not until fulness, vivacity & strength have yielded to emaciation, melancholy & debility. that he recognises the slow & silent invader. In such cases. derangement of the digestive organs. appears anterior to the other symptoms. The numerous sources of such an attack may referred chiefly to irregularities in diet. exercise & drinks. & to family predisposition. The excesses of ~~diet~~ in high life. & the meagre sustenance of poverty are alike favourable to its production. To the indolent whose stomach never experiences the healthy stimulus of exercise, & to the martyr of excessive exertion. it is equally obnoxious. Immoderate drinking is a fruitful source of this disorder, whether the libations be made at the fountain or the tap. The abuse of ardent spirits has not that influence in producing diabetes, which is generally supposed. On drawing up a table from numerous & authen-

tic cases ~~of the habits~~ of the habits of the patients & the cause of the disease: I find that only one tenth have been men of intemperate habits, & in these the disease resulted from lying out at night & exposure to the weather. Considering also that the greater number of these reports are of Hospital cases, the proportion of intemperate is little greater than in any other disease. Astonishing though it may appear, the instances of diabetes produced by cold water & cold aqueous fluids are more numerous than those from the abuse of ardent spirits. This happens either from its immoderate consumption as a habit, or from a sudden impression.   Of family predisposition Rollo alone abounds in ample proof. Storer there relates the connected history of a diabetic father, son, daughter & grandchild, & three also of another family. Rollo has also the joint case of three brothers. Areal confirms the same. & Girdlestone, Morton & Isenflamm are likewise quoted. It is said that the latter relates the cases of seven children in the same family.

The causes which produce this disease with more rapidity are few in number. Cold in various forms appears to be one of the most effective sources. Certain impressions & emulations hereafter to be mentioned have a similar action. This disease is frequently brought on by certain ingesta. Thus Paracelsus writes that Alphonsus king of Naples fell into a diabetes from eating quinces. Bonnetus & Willis relate such a case occurring after a debauch in wine: & Dr Chapman relates a similar case in a woman, from supping on cold lamb & cabbage.

The pathology of diabetes is interesting & intricate. The various attempts which have been made to reconcile & explain the various phenomena, may be distinguished

by the denominations of the renal, the communicating, the sanguineous & the gastric, time being too precious to allude to those of Meade, Mosch, Van Helmont & others.

The renal pathology bears the honors & the errors of antiquity. The ancients being ignorant of the saccharine nature of the urine reasoned correctly in supposing diabetes an increased secretion. Aretaeus thought it a cold & Galen a hot temperature of the kidneys. The former thought it a dropsy differing only in the locality of the effusion, & the latter gave the kidneys a morbid appetency to attract the serum from the emulgents, & an atony of the pores to transmit it freely & unchanged. Both thought that the solids melt & pass out. To the heat of Galen Aetius added the afflux of sharp diuretic humors, & Paracelsus supposed a union of chemical & vital phenomena. Etmuller & Richter urged also a diuretic stimulus, the latter teaching farther a spasm of the renal vessels. Denault in an article little quoted, ranks the affection of the kidneys as one cause of the disease, consisting in a relaxation of the vessels & an irritation of these organs. Duncan supposes something similar. Van Swieten considers diabetes as a relaxation of the renal ducts, & Fernel as a metastasis to the kidneys. The ablest & boldest defender of the renal pathology is Dr. Good, who has concentrated all his vast resources in its defence. Adopting the doctrine of Galen, he has given it a modern aspect, the material alteration being the supposition of a peculiar renal inflammation. Thus arranged it will account, in his opinion, for all the other symptoms. The morbid irritation will in this way account alone for the quantity of urine. In the blood he sees nothing but the signs of inflammation & in the secretion of sugar no anomaly because it is formed by other organs in health & in disease.

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Darwin also looks upon diabetes as an inflammation of the kidneys.

The communication of the stomach, with the bladder or kidneys, is an old creed. The majority of the ancients believed altogether that such was the course of the urine. Even later days it has been assumed to explain the quantity & qualities of diabetic urine: For, when we discover that the chyle & diabetic urine were as the same, we assumed it with the same ineffable ease to communicate the qualities of the one to the other. Hippocrates believed the office of conducting the urine from the stomach to the bladder to be performed by certain veins. Sylvius taught in diabetes, the enlargement of the passages or pores at the bottom of the stomach by which the liquids were to pass through the omentum to the kidneys. Etmuller also says that the cause of the true diabetes is the openness of the passages leading from the primae viae to the reins. "Tis true, says he, these are not yet discovered, but the quick passage of some fluids & their evacuation without any alteration in colour taste & smell, would seem to favour it." The observations of Galen & Hildanus confirm the same & also those of Bartholin who referred the cause to the [illegible] The ingenious & youthful Darwin distinguished himself by the developement & final improvement of this hypothesis. The leading idea was a supposed sympathy among all the branches of the lymphatics insomuch that when any one is stimulated into unusual kinds or qualities of motion, some other branch has its motions either increased, decreased or inverted at the same time: this sympathy he supposed to depend upon habit. This doctrine rests upon two suppositions, the sympathy & inverted action of the lymphatics, & the existence of these vessels between the stomach & urinary organs. Physiology & anatomy disprove either.

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Sennertus believed that there is a passage between the liver & the kidneys.

During the vacillations of medical hypotheses a disordered state of the blood has received many firm & able supporters. Long partially hinted at Willis first employed it to explain diabetes. An advocate for the chemical doctrines he supposed a certain proportion of salts necessary to the proper crasis of the blood, by the absence or crystallization of which, the fusion of the blood takes place & it is prematurely deprived of its serum. Sydenham adopting the idea of Willis sustained it by a more tenable & intelligible hypothesis. He referred it to the want of a proper assimilation. "The juices, says he, in his Processus Integri, which are brought into the blood being crude & undigested, seek a way both through the urinary ducts." He thought the crasis of the blood might also be thus weakened from fever or the loss of blood & being unable to assimilate the juices they are discharged unconcocted. Salmon developed still farther these doctrines of Willis & Sydenham. He supposed the loss of affinity between the crassamentum & serum to arise in many cases from a loss of the concoctive faculty of the stomach & bowels. Cheyne in his "Essay on Health" continuing the strain of the English philosophers, mentions, that when those living freely discharge large quantities of pale, limpid & sweet urine, it is a sure sign that perspiration is stopped & that neither the first nor the secondary concoctions have been performed. Desault also blamed a faulty assimilation, thinking notwithstanding his other opinion, that it may be considered as the immediate cause of this disease, without any morbific affection of the kidneys. They who will examine the formularies of a century since, will find the remedies for this disease among the incrassants. Thus in the Prescripts

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of Fuller & Radcliffe. & in the pharmacopœias of Bates & Salmon, we discover the sanguineous the reigning hypotheses. Thus proceeded the doctrine of unassimilated blood with few or no references to digestion until a proper analysis of the urine gave a new impetus to inquiry. No one now supposed that digestion went wrong, the healthier the chyle the sweeter, & the better it explained the phenomena of the disease. This was particularly confirmed by the supposed discovery of Dobson. Home enlisted with the common voice & never, as has been asserted, hinted at any disorder of the digestive organs. He supposed that sweet healthy chyle, under a normal action of the system, is now converted into the ammoniacal salts of the urine, & that the appearance of the saccharine matter in the urine, shows a great defect in the animal process. Thus his suggestion extended thus far, that the sugar is the vegetable part of the chyle, & that the urine is under certain circumstances saccharine, or otherwise, as the stomach is filled with vegetable or animal ingesta. However attentively we consider this pathology, we must be struck with the number of concurring facts, & the crowd of noble defenders. The examination of the blood has proved & disproved nothing, because it has been made on that which has been subjected to the capillaries, venous blood instead of arterial. It has been repeatedly observed since the days of Morgagni, that blood drawn soon after eating exhibits decided marks of the presence of chyle. Haller has observed the same in the urine of those who were exhausted & had eaten of much indigestible food. Celsus, Ettmuller, & van Swieten speak of the same in diabetic urine. Our objections to this pathology are simply these. 1st It does not account for all the symp-

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ptoms, especially the gastric. 2^d^ the proportion of sugar in healthy chyle forms too small a one to the saccharine matter of diabetic urine.

The gastric pathology is one which has been deduced from extensive observation the most approved physiological principles, & the succeſsful experience of the friends of science & humanity. The pathology which will be defended in the remainder of this thesis is principally this.— The existence of gastric irritation; from this a faulty digestion & assimilation, with a destruction of the equilibrium of the various organs, as regards both action & supply. These are the propositions, in the developement of which we hope to reconcile their mutual tendency to a similar result.

To prove the existence of gastric irritation we advance the following facts & positions; & firstly with respect to the symptoms. The gastric uneasineſs, the tenderneſs at the epigastrium, & the actual pain in the stomach & bowels which we have before alluded to are symptoms indisputable. Nor is the discharge of a peculiar secretion from the stomach an index to be diſregarded. In the usual irritations of the mucous membranes we have a discharge of a more or leſs acrid greenish mucus, varying perhaps in the different portions of that tissue. This diarrhea of the stomach, as exhibited here, & in Pyrosis, dominates a fluid differing little from the ordinary morbid mucus. The effect of such a gastric liquor upon the chyle is not known; it might be well to hold in memory the experiments of Kirchoff, in converting vegetable substances into sugar by means of acids. The melancholy & incapacity which attend this disease are alone striking evidences of its gastric origin. Morbid irritability of the

stomach, exerts a powerful influence upon the mind; & the same is the effect of all gastric diseases. In reference to the mental affection: the emaciation in this disease is peculiar; for in the wasting from chronic diseases of other organs, except the liver, are usually found the hopes & the faculties unclouded. The emaciation is owing to the stomach, for this symptom according to the observations of an ingenious author chiefly follows the diseases of the organs of supply. The morbid thirst is also a proof of gastric irritation. Healthy thirst in the physiology of the day, consists in an irritated state of the lining of the oesophagus & stomach: morbid thirst evinces an irritation more intense, & is derived from impressions made directly or indirectly upon the stomach. We instance the former by salt food, strong liquors, & poisonous drugs, & the latter by corporal punishment, surgical operations, & wounds in battle, & from poisonous reptiles. The thirst in such cases, doubtless proceeds from the irritation of the stomach, because if these impressions be continued, or the patient be peculiarly irritable, they give rise to nausea, vomiting, & the greatest gastric distress, terminating, equally in gastritis. Hunger when carried to excess may in like manner be an increase of the natural irritation: thus bulimia arises in like manner from direct & indirect impressions. The former we see from many condiments & the presence of worms in the stomach & duodenum; of indirect gastric irritation as occasioning irregularities in the appetite, the foetus in utero, teething & exercise present good examples. Impressions on the skin from cold have a similar effect. Brutus after a forced march through the snow was seized with Bulimia: This disease says Plutarch affects both men & cattle after similar exposures. That these impressions act by irritation & that hunger is a degree of the same appears from this that in pregnancy it

proceeds to nausea & vomiting: & after exposure to cold death follows from inanition or accrual of the inseparable gastric irritability.

The causes of diabetes tend in the same manner to prove its gastric origin. It has been shewn to result from excesses in diet, exercise & drink, as also a defect of the food; causes well calculated to make strong impressions upon the stomach: It has been shewn to result from cold, from intense study, fatigue &c. in fine from all the causes of dyspepsia: It has been shewn to depend often on family predisposition, which is mostly confined to diseases of the digestive organs. We have said that it results from certain permanent irritations. Willan, Bardsley, Watt & Wilson mention cases of pulmonary irritation. Cowley the case of a pancreas loaded with calculi in a diabetic, in whom all the other organs were healthy. Bardsley held a hydatid in the kidney. & Wilson a tuberculated spleen. Cheselden mentions in his anatomy a case of diabetes coexistent with carbuncle. Latham.[+] These facts with respect to carbuncle cannot be surprising to those who have read the constitutional derangement & gastric disorder attending them, as mentioned by Abernethy. Pitcairne gives us a case, in which the bite of a venomous animal produced swelling & abscesses all over the body attended at the same time by diabetes. I have read two cases one in Latham & the other I believe in Bardsley in which diabetic patients from being wounded became worse & died. It is not improbable that some diabetic cases may have arisen from the bite of the Dipsas, & helped in this way also to confer that name upon this disease. The most convincing proof however which we have of the production of diabetes by foreign irritation is in the cases of children during <u>teething</u>. Of this

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Dr Dewees has given several interesting cases. & we have many others in the works of Venables & Underwood. This fact is alone conclusive to my mind, that diabetes is a disease of the digestive organs.

Having advanced thus far. it may be proper here to consider those appearances which have been considered to favour the renal pathology & militate against every other. Having hitherto made few allusions to post mortem examinations. we may now state some of their results. The kidneys are often flaccid & enlarged though in many cases they are perfectly healthy. We all know the description of Baillie: though generally enlarged the kidneys are almost always flaccid: sometimes they are red but oftener pale. The ureters are sometimes enlarged, the bladder thickened & the urethra excoriated. What are such appearances to prove? In favour of the renal pathology nothing. In more than one fourth of the reported dissections the kidneys are sound. & had the proportion been much less it would have been sufficient to prove that the disease is not always a + The flaccid & enlarged state of the kidneys. is the result of an increase of their vascularity. from the irregular distribution of the blood. The cause is partly this: In all cases in which there is no exhalation from a cold, dry skin, & the other secretions are stopped, we have a congestion in the large vessels of the internal organs & a consequent increase of urine. Such then is the state of the kidneys exhibiting more the flaccid appearance of an engorgement of its venous ramuscules. than the hypertrophia of slow inflammation. Finding the kidneys then healthy. engorged. flaccid. full of pus, or containing an hydatid. how are these various states to explain the same

+ disease of the kidneys.

phenomena. This is my solution; the acidity arises from engorgement, pus from the want of mucus & the irritation of a foreign fluid and the hydatid an accidental object which probably irritated the stomach sympathetically. In that way I account also for both kidneys being inflamed at the *same* time. and here I propose a query which is insurmountable by the renal pathology. If diabetes is a disease of the kidneys how happened it, that there is no diabetes *of one* kidney? How happens it I say that when in the great proportion of cases especially inflammatory in which one kidney only is affected, that in *this case* we should never have *one*? When any other gland in the body is inflamed its secretory powers are diminished. here we are to be persuaded into a belief that they are increased. Now I do not believe that the kidneys are organs varying so much in their equilibrium as many would have us believe. & this I present as my reason. The urine is deposited in the expansion of mucous membrane which lines the bladder. In health the much greater proportion of the urine secreted, or rather its aqueous parts are by this reabsorbed. When however the urine possesses certain foreign properties as those of alkaline & other diuretics, & particularly saccharine matter & when further the mucous membrane is irritated, it is not at all absorbed. & we have a great increase of the discharge. There is also in addition to these evidences, and in addition to the symptoms & causes of diabetes which cannot be explained by the renal pathology, another fact which militates strongly against it. It is this. The urine after fasting all night is much more saline than it is in the afternoon. when the diabetic has eaten during the day. From a review of all these facts & statements I am led to the conclusion that the kidneys never

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can out of *healthy blood* secrete saccharine urine.

Theory is a mental invention by which we connect, reconcile & explain the various facts of an individual science. & so long as this office is performed it is entitled to our regard. When observation has discovered new facts, or invalidated those formerly entitled to credit, it is opposing the cause of truth to mould the facts to the theory. The links of the chain must be proportional to the developement of facts, in other words, the *theory* is to be changed. Rollo's theory of diabetes was once true - since, numerous observations have rendered it improbable that sugar either exists in the blood, or is formed in the stomach, although the statements of neither party are perfectly conclusive, the weight of objection is worthy of regard. The propositions of the gastric pathology with respect to the formation of sugar in the blood were merely hypothetical, & yet they were better supported than any which had previously been advanced. I deem it however unnecessary that the stomach should form sugar in order to explain its elimination. This much however it may be required to grant, that there is a vital power in the system; in the language of Broussais, a vital chemistry, resisting, & in certain cases overcoming the disorganizing chemical affinities to render substances subservient to nutrition. What is more probable, indeed, what is more true, than that this power has its increase & its decrease? Whenever it presides too feebly over the circulating fluid, the organs do not bring this up to the proper standard. How dispose of the unwieldy cargo? Nature tells us in the great organs of waste. When that great organ the blood is too great for her control, she assigns a part to the kidneys & concentrates her powers upon the remainder. In the ordinary variations of health

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and disease the urea serves all purposes. But in the cases of disordered function of the prima via deluging her with badly elaborated chyle she resorts to the production of saccharine matter, as the bee consuming more than it is able to assimilate, eliminates the excess in his bladder of honey. It does not then appear to us necessary for sugar to be formed in the stomach & conveyed by some means to the kidneys. It is only necessary to consider the disabled state of the stomach; the loss of the governing power, & the defective secretion of bile & pancreatic juice: It is only necessary to consider the great difference in chyle formed from vegetable or animal ingesta, & the great quantity of vegetable food consumed; & that with the improper gastric secretion it forms a chyme; differing considerably from healthy chyme, yet differing *so little* that the lacteals transfer it without much difficulty to the venous repository. It is only necessary to consider further that if the powers of the stomach & blood, appropriated to digestion & assimilation, be distributed to a proportion of chyme & chyle so far beyond the natural, & so much altered in quality, that the urea thus supplied, though not saccharine, must differ in many respects from that which is healthy, facts description has abundantly shown. It will be said that in some persons the food has not been above the natural quantity: the fact is admissible & the explanation plain. The food has either been of that indigestible character, or the powers of life so weakened, that in either case it is impossible to assimilate. We see the same operation performed in health, in the passage of certain substances to the kidneys, which nature being unable to assimilate guards them in transitu so that they are not found in the blood, & permits them to assume their original form in the bladder. Cases in which this occurs after the long use

of meagre diet with inordinate labour or after attacks of fever are thus easily explained. Of the vital or assimilatory powers being disproportionate to the quantity of chyle; we have several interesting cases. The following is one to be explained by no other theory. A young lady Æt 12. a patient of Mr Sheriff; was able to digest three biscuits daily without the least appearance of saccharine matter. but a fourth being added to the allowance the urine immediately became sweet. Bardsley reports numerous instances in which he permitted small quantities of vegetable diet, throughout the cure. not only without injury. but as greatly alleviating the disgust from animal diet. And why? Because the patients were able properly to assimilate smaller portions of such chyle. We do not broach this doctrine to suit this disease alone, for digestion & assimilation in health, have the power of overcoming only a certain quantum of ingesta. We can digest only a certain allowance of food. and in all cases of excess it returns from the stomach. passes through the intestines. or remains an unmanageable weight upon the stomach. Now these are three circumstances which in diabetes do not occur. In that disease the excess of food is not evacuated by vomiting. in some cases indeed it has been found almost impossible to produce emesis. by the largest doses of antimony. That the surplus is not carried off either by the stomach or bowels arises from one irritation already having possession of them. a loss of power in the muscular fibres of the canal consequent always to irritation. a defect of the bile & pancreatic juice & finally a deficiency of the mucous exhalation. Mr Abernethy mentions a case irritated stomach in which it required large & repeated doses of purgatives to move the intestines. The like occurring in the present case.

The food then which enters the stomach of the diabetic in such great quantities is in some manner digested & in some form disappears from the canal & enters the blood. The absorption may thus be partly accounted for that the discharge from the kidneys being increased & absorption in the bladder diminished, the powers of the lacteals are so much increased that they suck a fluid with avidity which in health they might reject.

Before entering upon the treatment of this disease, it may be proper to recapitulate the outlines of our pathology. From certain causes direct or indirect we have an irritation of the mucous lining of the stomach ~~& bowels~~, the effusion of unhealthy gastric juice & a morbid increase of hunger & thirst. Thence follows the reception, digestion & lacteal absorption of ~~a~~ large quantities of vegetable ingesta, far exceeding in quantity & qualities the powers of assimilation. Under these circumstances it is guarded in transitu & thrown out of the circulation by the kidneys in the form of saccharine matter. From the irritation of the stomach & the determination to this organ, there is a chronic congestion in the internal venous circulation, which joined to the nature of the fluid, prevents secretion in the other organs. The quantity of the urine is increased simply because much liquid is taken, & because moreover the bladder refuses from certain causes to absorb this diabetic fluid.

The treatment of diabetes has called up successively all the inventions of human ingenuity. The history of the disease in this department being in many parts of importance barren, & my own experience unimportant, no apology will be effec

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be offered in brevity. We shall first mention the most popular methods of cure before the time of Rollo. The first of these was the astringent: dating its origin from Celsus, urging that "the food is to be astringent & the wine rough & strong." As this practice obtained in various forms the medicines used, were rose water; tormentil, pomegranate, lime water, oak bark, the sulfate of iron, sealed earth, & with many others, alum. Old Dover says "there needs nothing in this disease, than to drink quarter of a pint of alum posset, first & last, as strong as your stomach will bear it. The second practice is the Incrassant built upon the doctrines of Sydenham & Willis. The substances used under the title of incrassants to thicken the blood, were rice, starch, mucilages gums, wine, albumen of eggs &c Sydenham added to these, nourishing diet & a variety of tonics "to strengthen the blood."

From our pathology of this disease we derive with some diffidence the following indications of cure."

Ist To reduce the morbid irritability of the stomach. IInd To correct the gastric menstruum. IIId To avoid all those circumstances of diet either as to quantity or quality, which augment every symptom of the disease. IVth To assist the conservative powers of the system by reducing the circulating fluid. & Vth To restore the functions of all the other organs. Such are indications of cure so directed as in part to favour our pathology of the disease & so arranged & altered likewise as to introduce; without introducing also any convulsion of the system, the whole catalogue of remedies.

The morbid irritability of the stomach being maintained by causes either direct,

a indirect. our practice should be directed in a similar manner. the means proposed d pursued by the most experienced practitioners to meet the former part of this indication. consist in the use of certain sedatives. as opium camphor. assafoetida. musk. hydrosulphurets & tepid water.

The use of opium in diabetes is ancient. Aetius first recommending it. we find it afterwards mentioned in all our old authors. In the present day its employment is extensive. & has been well established from the standard authorities in medicine. If solely used on in the cure of diabetes. this disease is apt to relapse: it would appear therefore better as a powerful adjunct. Some wish to ascribe the beneficial effects of this remedy to its diaphoretic properties. The diaphoretic [illegible] made. I suspect that in those cases in which diaphoresis is apparent it is the natural result of the relief of the other symptoms. The other remedies mentioned appear to have similar powers. Camphor was used by Thier. assafoetida by Richter. musk by Nicholas & Gueudeville. & the hydrosulphurets by Rollo. Water has received from [illegible] particularly the title of sedative. the patient must not drink much of it though it be with [illegible] to be cold. Tepid water as recommended by Meade & Trent would be better because it is nauseous, & determines to the skin.

The irritability of the stomach has been also removed by bringing about a change of the action. These may be called "les moyens perturbateurs". The usual resort is to emetics. an old established practice. In whatever cases I have heard of their use it has been with advantage. Ipecacuanha might be preferable. because its action on mucous mem

tianes is somewhat peculiar. Richter cured a case with this medicine alone in small doses. Tartrate of antimony has been used with similar succeſs. Cantharides have been prescribed in diabetes by Brisbane, Woodville & Ontyd. probably they act like emetics in changing the gastric action. We know that they are of use to the mucous membranes, as in pertussis & leucorrhea.

Of the means to be pursued in this disease when it arises from a foreign irritation, we know very little. It is obvious that such an irritation ought to be removed if possible. Narcotics might also render the stomach insensible to such sympathies

II To correct the acidity of the gastric menstruum we have several remedies, although they are not administered with that intention; as several of them possess also tonic power. The best medicine of this kind is lime-water which is used with much succeſs. Carbonate of ammonia is also good. & the carbonate of magnesia, which Sutton recommends highly. This indication is not primary. & yet were the ingesta to be guarded by an absorbent it might exercise a beneficial effect.

III. The dietetic regimen of Rollo has thrown light on the pathology & succeſs on the treatment of diabetes. Aetius had advised pork & good wine, & Sydenham light & digestible meats, but neither practised with principle or succeſs. Home alone anticipated & tr. the that by a speculation which he never realized. And yet this practice was [illegible] course, it was the result of a view originating with Willis & Sydenham; continued by Cullen & Dobson; improved & enlarged by Home & finally perfected & established by Rollo. The animal diet was the result of a beautiful series of pathological inquiry & medical

reasoning: Its practice however is less understood. The animal diet is not a positive aid in the relief of diabetes the patient afflicted with intense [illegible] he will eat same meat food it that of which he cannot largely partake; & which at the same time is least injurious. Animal food will in the great majority of cases prevent the formation of saccharine urine; but if taken before the system has resumed its healthy action one excess of vegetable food will instantly reproduce it. Our true indication then is to lessen the ingesta, so that the patient may eat either animal or vegetable food, if he transgresses not at certain times. This is the discovery of Bardsley. Wishing then to withdraw causes of gastric irritation, & thus prevent the formation of saccharine urine, & wishing with the same view to assist assimilation, we ought, as far as diet is concerned, to use small quantities of mixed food.

To have a scale of the facility with which certain articles of food produce sugar in the urine is a desideratum. Mr Thomas attempted a few imperfect experiments of this kind upon one diabetic, & these have been palmed upon the public, by the American Editors of a modern practical work, as deserving of high credit. I should think that the digestibility & fitness must be similar.

IV. We now arrive at our fourth indication: to unload the internal vessels, & assist the recuperative energies, by diminishing the circulating fluid. From the manner in which patients with diabetes bear with bleeding we have another proof of the repletion of the internal venous system. Hence large quantities are taken without a loss of power in the heart, reaction taking place, & the pulse rising either during or shortly after venesection. It has been rendered probable that one of the morbid alterations in this disease is a deficient depuration of the

ntrolling assimilatory power. In resorting to the kidneys nature would soon be relieved.
she were not deluged by the inordinate supply & excessive action of the primæ viæ which
ught her to the brink of destruction In addition to other benefits venesection here establishes
second safety valve. We cannot have a more beautiful example of the gradual return
assimilation; than is shown in the successive improvement of the blood. Take e.g. Mr
Hall's summary of a case. "The blood was pretty much the same as is generally met with in"
natics & seemed to agree with the description given by Drs Hollo & Dobson. little change"
k place in the first three bleedings the fourth however was greatly altered. It had be"
me sizy on top, & in cooling the crassamentum acquired a considerable degree of firm-
ness. the fifth was *remarkably inflamed*: the buffy coat was thick & firm. & contracted
the size of a shilling. the coagulum had assumed a globular form. & become so te-
nacious that it could be held out on the point of a probe. the sixth was still firmer &
in addition to other appearances. the serum had acquired a white chylous & milky ap-
pearance. These changes in the blood were singular & unexpected. but I have often seen them
since". Such is the description given by more authors than Mr Hall. & such is the
progressive resumption of the assimilation, until the blood from a weak & dissolved
state regains its proper crasis. "This I have no doubt is the process in every method of
cure. & can be effected in several ways especially by a well regulated diet." "The
return of the circulation to its equilibrium & healthy standard is not less re-
markable than that of the blood. the external veins which during the height
of the disease were almost closed to the perplacement, fill again when returning

health demands their service. Mr Watt says, that during the course of venesections they become more & more turgid. In one of the numbers of the Edinburgh Journal Mr Murray of Belfast. thus describes the effects of a first venesection "nineteen ounces of blood were taken from the arm, in a full stream. & the patient & bystanders were astonished to observe the artery at the ear beginning to beat with great force. & the veins of the hands & arms filling up." We had intended to follow this up with a few remarks but the whole is so striking to a reflecting mind: that we leave it uncommented.

Before concluding this most interesting indication, it may be proper to endeavour to allude to the antiquity of venesection in diabetes. [illegible] writes, that in the commencement we may breathe a vein." to cool or pluck back the humors" Bonnetus also says "all people write that in the commencement a vein must be breathed" which is equivalent to declaring that it was a common & popular practice. these statements out of many others abundantly evince that there is no novelty in the practice of venesection. An observation of Rollo's however chiefly prompted Watt to give the remedy an impartial trial; the event of the experiment richly rewarding his intrepidity. A host of authorities have confirmed the truth of his representations. This practice is I believe rather on the wane in Great Brittain.

V. Our last indication is to restore the functions of the cutaneous organs We have already attempted to show that the functions are kept inactive. by the other symptoms of this disease so that when the irritability of the stomach & its attendant circum

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stances are removed. the organs resume their routine of operation. There are times & cases however, in which we may feel disposed to assume another side of the balance, & restore the equilibrium by direct impressions upon the organs.

The skin is an organ, upon the restoration of the functions of which, much has been written. & much has been attempted. The methods made use of in diabetes, to restore circulation & exhalation to this organ, are three. by external means, by internal. & by exercise. Celsus practised the first. advising frictions in the sun or before the fire. The Arabians, if Bonnetus is to be believed, have long made use of sweating in this disease. Thenerius also speaks of it, recommending the application of vapour from a wooden utensil. Marsh prefers the vapour bath to any other method. + Internal diaphoretics were here in like manner first used by the Arabians. which were nothing else but warm teas of sarsaparilla, china &c. The great medicine at the present period is Dover's powder, which answers numerous valuable indications. The properties of its constituents have already been alluded to. and I may be permitted to suggest. that they may always be used in combination with increased benefit. The third practice of exciting the skin by exercise or hard labour originated with Van Swieten. He relates a very interesting case of a gardener whom he cured in this manner. Carter & others have lately related many similar cases.

The liver is another organ which may sometimes be acted on with success. It is probable that whenever we reclaim the functions of the skin. that we at the same time are of great benefit to the liver. Richter used mercury

+ Dr. Dewees makes use of spirits of turpentine externally. in children

with succeſs in several cases of diabetes; & I have been informed by a freind that he has cured a few cases of this disease with calomel purges. Diabetes however is sometimes attributable to the abuse of mercury. Many cases of this disease have been releived by Scott & others under the administration of the nitrous & nitro-muriatic acids.

In concluding the last division of our subject we may observe that there are a few remedies which cannot be claſsed. Among these I consider phosphoric acid, the powers of which if existing, cannot easily be explained.

The use of topical bleeding has been advised among others by Dr. Chapman. When the lining membranes of the pelvis of the kidneys are inflamed this must be an important adjunct, & being applied at no great distance from the epigastric region, must in like manner releive the stomach.